

Histological Study on the Sinu-Atrial Node of Turkey

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Abstract: Histology of the SAN was studied in 5 female turkeys by using routine histological techniques. The SAN was located in the region between the orifices of the right cranial vena cava and of the caudal vena cava and beneath the atrial epicardium. Its shape was conical to a limited degree. Its cranial end was near the right auricle and it was narrower than the caudal end. The caudal end was near the lateral wall of the atrial wall of the right atrium. At the caudal end of the SAN there were cellular chains which allowed the node to enter surrounding atrial myocardium. These cells were narrower and lighter than the myocardial fibers. The SAN of turkey had no central artery. Histologically, it contained a very little collagen and the nodal cells were mainly located as cellular strands which were narrower than the ordinary myocardial fibers. Since, the nodal cells contained less myofibril than ordinary myocardium; therefore, they were distinctively paler. At the junction between the nodal cells intercalated discs were not seen.

Key words: Turkey • heart • histology • sinu-atrial node

INTRODUCTION

The histology and anatomy of the sinu-atrial node (SAN) was studied in human [1], dog [2], cattle [3], horse and mule [4], rabbit [5], camel [6], domestic cat [7], goat [8], rat [9], guinea pig [10], fowl [11] and ovine fetus [12]. The present study was, therefore, undertaken to deal with the histology of the SAN in the heart of turkeys.

MATERIALS AND METHODS

The animals were checked for health, slaughtered and the heart with its pericardium was dissected free and flushed with warm (40°C) normal saline. The heart was perfused with 10% buffered formalin. The upper part of the right atrium along with the right cranial vena cava and caudal vena cava was separated and kept submerged in the same fixative for 72h. The mentioned piece was trimmed and processed. Serial sections at 6µm thickness were cut transversely from the right cranial vena cava and caudal vena cava toward the atrium. The sections were mounted and preserved. The sections were selected by the interval of 3, stained with the method of green Masson's trichrome [13] and examined.

RESULTS AND DISCUSSION

In the turkey's heart, the SAN lied in the region between the orifices of the right cranial vena cava and of the caudal vena cava and beneath the atrial epicardium. This location is similar to that in fowl [11]. The SAN in the heart of human [1], dog [2], cattle [3], horse [4], domestic cat [7], camel [6] and goat [8] is located at the junction between the cranial vena cava and the right atrium at the sulcus terminalis. In rabbit, it is located at the junction of the midportion of sinus intercavarium and terminal crest [5]. The turkey, similar to guinea pig [10], rabbit [5] and rat [9] normally have a left cranial vena cava. The SAN of turkey was conical to a limited degree. Its cranial end was near the right auricle and caudal end was near the myocardium of the atrial wall. The cranial end was narrower than caudal end (Fig. 1).

This shape of node is almost similar to those of goat [8], dog [2], cat [7], rat [9] and ovine fetus [12]. While in human it resembled and extended like a snail with its shell and also was subjected to considerable variation [1]. In horse tapering cranial and caudal crura of the node encircled the lateral half of the junction of the cranial vena cava with the right atrium [4]. In rabbit, the shape is oblong with its long axis parallel to the terminal crest [5]. In camel, it is elongated in shape and bent oblong [6].

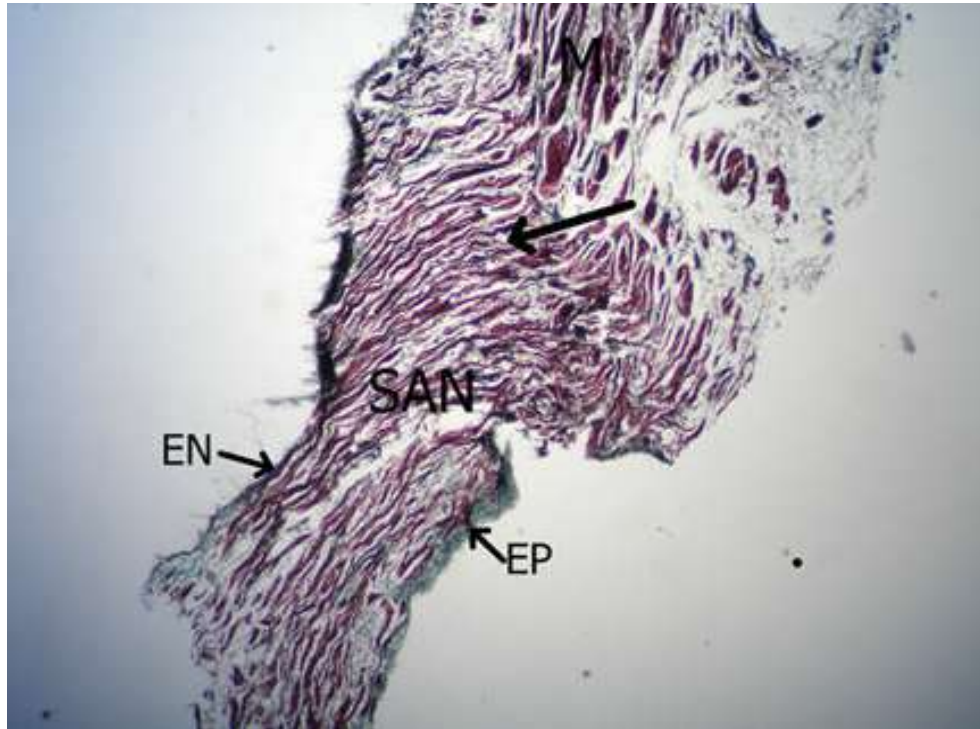


Fig. 1: Anatomical location and shape of the SAN in the heart of turkey, sinu-atrial gland (SAN), the lateral wall of the right atrium (M), caudal end of the node (arrow), epicardium (EP); endocardium (EN). (green masson's trichrome staining X64)

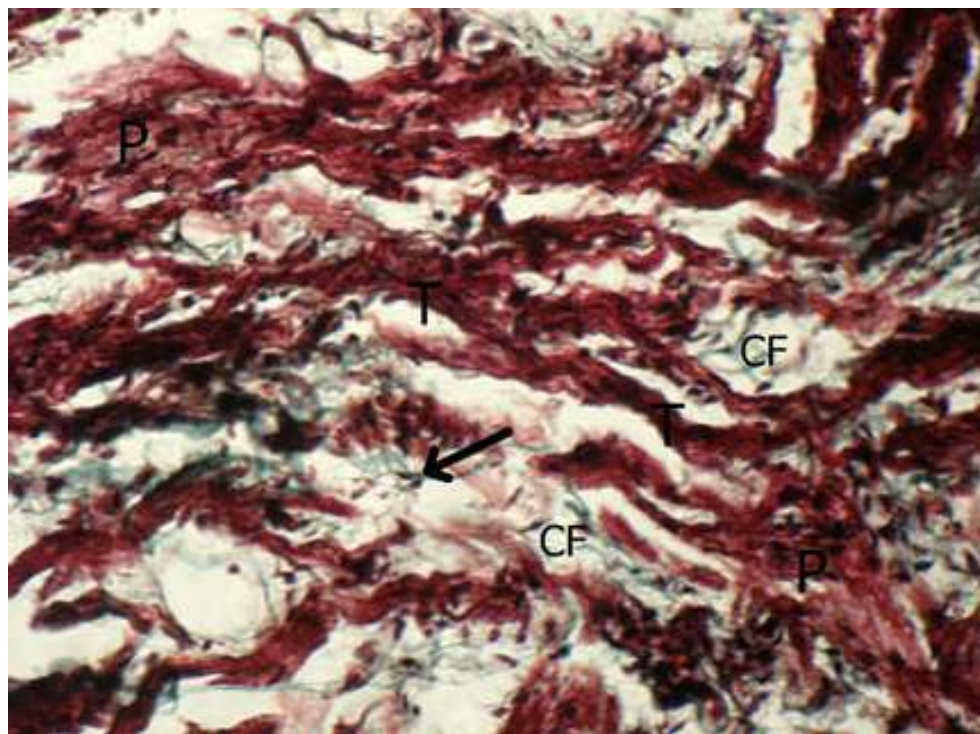


Fig. 2: Microphotograph of the SAN in the heart of turkey showing perinuclear clear zone cells (P), transitional cells (T), fibroblast (arrow); Collagen Fibers (CF), (green Masson's trichrome staining X 640)

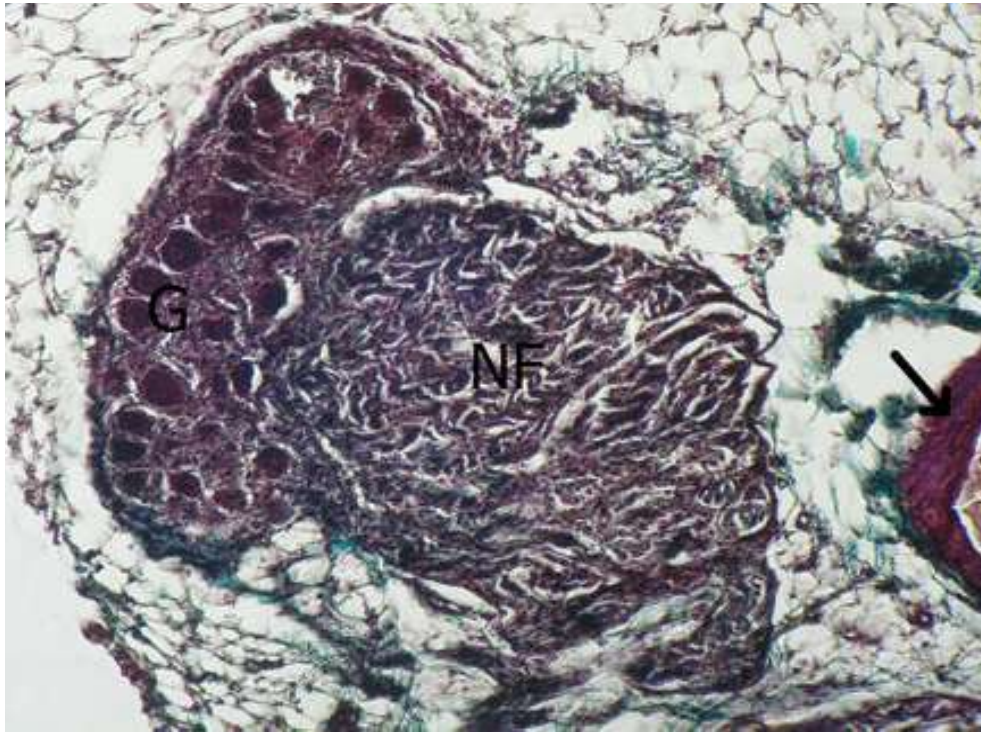


Fig. 3: Microphotograph of the SAN in the heart of turkey showing arteriole (arrow), nerve fibers (NF) and ganglion (G) at the periphery of the node. (green Masson's trichrome staining X 640)

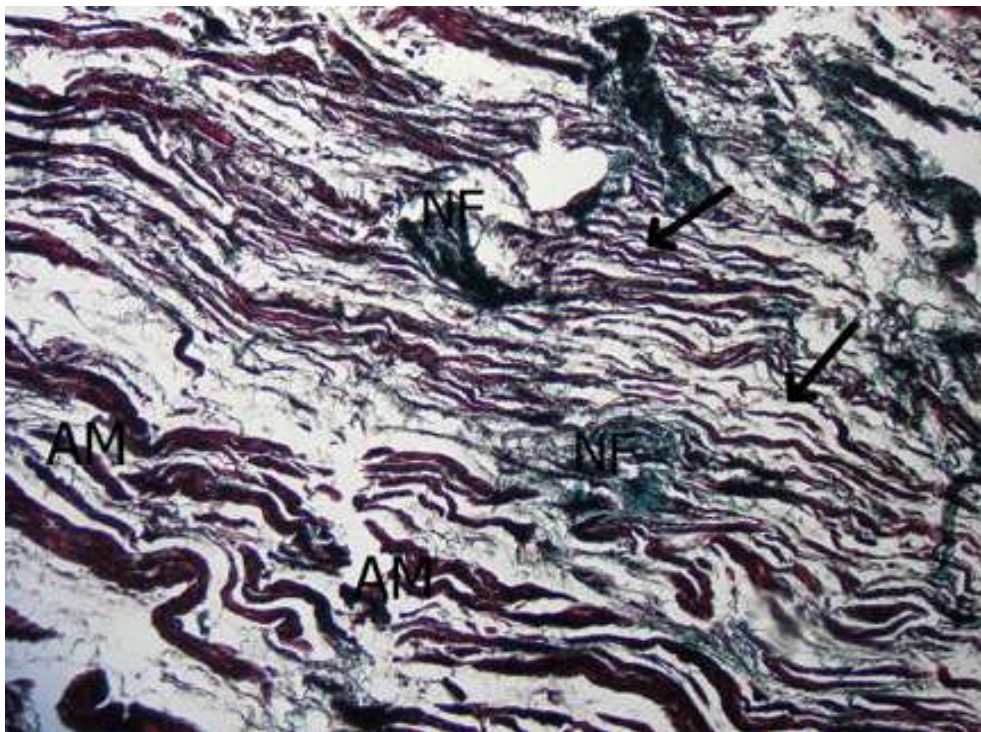


Fig. 4: Sowing cells (arrow) which leaved the SAN to enter surrounding atrial myocardium (AM); nerve fibers (NF) (green Masson trichrome staining X 160)

In guinea pig, its shape is like a trapezoid with curved sides [10]. According references number 1 and 11 the SAN is absent in the heart of birds. This is deferent with our finding that revealed the node is distinguished from the surrounding myocardium. Also, the SAN present in fowl [11] and house sparrow [14].

In turkey, the SAN was composed of mass of nodal cells which were not stained so deeply as the adjacent cells of the atrial myocardium. The nodal cells were smaller in size and there was a fair amount of collagen fibers between them. There were two kinds of nodal cells. One of these nodal cells was ovoid, with an empty appearing cytoplasm. These calls have been named "P" cells. The second nodal cells were slender and elongated but smaller than ordinary myocardial cells. These cells contained more myofibrils and formed the slender interweaving fibers as the major component of the turkey's SAN. These cells have been named transitional "T" cells (Fig. 2).

In contrast to turkey and other species, in rabbit [5], guinea pig [10] and ovine fetus [12] the proportion of "P" cells to transitional cells is exceptionally high.

There was a very little amount of collagen fibers in the turkey's SAN. In this respect, it was similar to those of rabbit [5], fowl [11], house sparrow [14], guinea pig [10], cattle [6] and ovine fetus [12]. While, in horse [4], dog [2], human [1], camel [6] and domestic cat [7], there were a large amount of dense collagen frame.

The SAN in turkey had no central artery, but there were one or more arterioles at the cranial or caudal ends of the node which supply it (Fig. 3).

In fowl [11] there is a nodal artery with two bifurcated branches in the SAN. The SAN of rabbit [5], cattle [3], domestic cat [7], goats [8] and guinea pig [10] also lacked the central artery. Whereas, the SAN of human [1], dog [2], horse [4], camel [6] and rat [9] consisted of a central artery and a general framework of collagen fibers, which were distributed around the SAN artery and the SA nodal cells while interlacing the collagen were regularly or irregularly organized around the central artery.

In the heart of turkey, there were many distinct nerve bundles and ganglions at the periphery of the SAN. In turkey same as other animals, there aren't any ganglion within the node. In turkey same as guinea pig [10], there were a little amount of nerve fibers within the node. In the cattle [3] and camel [6] the nerve fiber was only present at the periphery of the node. In contrast, in the horse [4], human [1], dog [3], domestic cat [7] and goat [8] the nerve fibers were abundant within the substance of the SAN.

At the caudal end of the SAN there were cellular chains which leaved the node to enter surrounding atrial myocardium. These cells were narrower and lighter than the myocardial fibers (Fig. 4).

These exiting tracts are most likely the route by which the sinus impulse is delivered to the atria and thence to the ventricles [2]. Also, their presence are reported in human [1], dog [2], cat [6], guinea pig [10] and rabbit [5].

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